

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~striketrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

1. (original) A document image correcting device correcting an input document image to be a properly orientated image, comprising:

a line orientation determining unit determining whether a line orientation of an input document image is either vertical or horizontal;

a character image extracting unit extracting a character image from the input document image;

a character orientation detecting unit detecting whether or not to require a rotation, a rotational angle if the rotation is required, and mirror image flipping, which are intended for correcting the character image extracted by said character image extracting unit to be properly orientated, in correspondence with a result of a determination made by said line orientation determining unit; and

a document image correcting unit correcting the input document image to be a properly orientated document image based on a result of detection made by said character orientation detecting unit.

2. (original) The document image correcting device according to claim 1, wherein: said character orientation detecting unit further comprises

an image converting unit converting the character image extracted by said character image extracting unit by rotating the character image, and /or by flipping the character image to a mirror image, and

a character recognizing unit performing character recognition for the character image converted by said image converting unit, and outputting a character code and a degree of likelihood of the recognition; and

it is detected whether or not to require the rotation, the rotational angle if the rotation is required, and the mirror image flipping, which are intended for correcting the extracted character image to be properly orientated, based on a result of the recognition performed by said character recognizing unit.

3. (original) The document image correcting device according to claim 1, further comprising

a language identifying unit identifying a language of the input document image, wherein the input document image is corrected to be a properly orientated image in correspondence with a result of identification made by said language identifying unit.

4. (original) The document image correcting device according to claim 1, wherein said character image extracting unit selects and extracts a character image a black pixel ratio of which is within a predetermined range.

5. (original) The document image correcting device according to claim 1, wherein said character image extracting unit selects and extracts a character image a ratio of a long side to a short side of which is within a predetermined range.

6. (original) The document image correcting device according to claim 2, wherein said character orientation detecting unit detects as a properly orientated character image an image having a highest degree of likelihood of the recognition performed by said character recognizing unit among the images to which said image converting unit converts the extracted character image with different conversion methods, and detects whether or not to require the rotation, the rotational angle from the properly orientated image to the input image if the rotation is required, and the mirror image flipping.

7. (original) The character image correcting device according to claim 2, wherein if there is only one image having a predetermined or higher degree of likelihood of the recognition performed by said character recognizing unit among the images to which said image converting unit converts the extracted character image with different conversion methods, said character orientation detecting unit detects the only one image as a properly orientated image, and detects whether or not to require the rotation, the rotational angle from the properly orientated image to the input image if the rotation is required, and the mirror image flipping.

8. (original) The document image correcting device according to claim 2, wherein said character orientation detecting unit detects as a properly orientated image an image that has a highest degree of likelihood of the recognition performed by said character

recognizing unit, and a character code which correspond to the image and is not predetermined, among the images to which said image converting unit converts the extracted image with different conversion methods, and detects whether or not to require the rotation, the rotational angle from the properly orientated image to the input image if the rotation is required, and the mirror image flipping.

9. (original) A document image correcting device correcting an input document image to be a properly orientated image, comprising:

a line orientation determining unit determining whether a line orientation of an input document image is either vertical or horizontal;

a line image extracting unit extracting a whole or a part of a line from the input document image as a line image;

a character orientation detecting unit detecting whether or not to require a rotation, a rotational angle if the rotation is required, and mirror image flipping, which are intended for correcting a character image within the line image extracted by said line image extracting unit, in correspondence with a result of a determination made by said line orientation determining unit; and

a document image correcting unit correcting the input document image to be a properly orientated image based on a result of detection made by said character orientation detecting unit.

10. (original) The document image correcting device according to claim 9, wherein:
said character orientation detecting unit further comprises

an image converting unit rotating the character image within the line image extracted by said line image extracting unit, and/or flipping the character image to a mirror image in correspondence with a result of a determination made by said line orientation determining unit, and

a character recognizing unit performing character recognition for the character image converted by said image converting unit, and outputting a character code corresponding to each character image within the line image, and a degree of likelihood of the recognition; and

it is detected whether or not to require the rotation, the rotational angle if the rotation is required, and the mirror image flipping, which are intended for correcting the character image within the line image extracted by said line image extracting unit to be properly orientated, based on a result of the recognition performed by said character recognizing unit.

11. (original) The document image correcting device according to claim 10, wherein said character orientation detecting unit detects an image type as a properly orientated image if the image type has a highest mean degree of likelihood of the recognition performed by said character image recognizing unit for the character image within the line image among image types to which said image converting unit converts the character image within the line image with different conversion methods, and if a preset number or more of predetermined character codes are not included among character codes corresponding to the character image within the line image, and detects whether or not to require the rotation, the rotational angle from the properly orientated image to the input document image if the rotation is required, and the mirror image flipping.

6 12. (original) The document image correcting device according to claim 10, wherein said character orientation detecting unit detects as a properly orientated character image an image type having a highest mean degree of likelihood of the recognition performed by said character recognizing unit for the character image within the line image among image types to which said image converting unit converts the extracted character image with different conversion methods, and detects whether or not to require the rotation, the rotational angle from the properly orientated image to the input document image if the rotation is required, and the mirror image flipping.

13. (original) The character image correcting device according to claim 10, wherein said character orientation detecting unit detects only one image type as a properly orientated image if there is the only one image type having a predetermined or higher mean degree of likelihood of the recognition performed by said character recognizing unit for the character image within the line image among image types to which said image converting unit converts the extracted character image with different conversion methods, and detects whether or not to require the rotation, the rotational angle from the properly orientated image to the input document image if the rotation is required, and the mirror image flipping.

14. (original) A document image correcting device correcting an input document image to be a properly orientated image, comprising:

a line orientation determining unit determining whether a line orientation of an input document image is either vertical or horizontal;

a character image extracting unit extracting a character image from the input document image;

a character orientation detecting unit excluding some of a plurality of patterns that include a pattern of the character image within the input document image, and patterns obtained by rotating the character image and/or by flipping the character image to a mirror image, and detecting whether or not to require a rotation, a rotational angle if the rotation is required, and mirror image flipping, which are intended for correcting the character image extracted by said character image extracting unit to be properly orientated, with the use of remaining patterns; and

a document image correcting unit correcting the input document image to be a properly orientated document image based on a result of detection made by said character orientation detecting unit.

15. (original) A document image correcting method correcting an input document image to be a properly orientated image, comprising:

determining whether a line orientation of the input document image is either vertical or horizontal;

detecting whether or not to require a rotation, a rotational angle if the rotation is required, and mirror image flipping, which are intended for correcting a character image extracted from the input document image to be properly orientated, in correspondence with a result of a determination; and

correcting the input document image to be a properly orientated document image based on a result of detection.

16. (original) A computer-readable storage medium for use in a document image correcting device correcting an input document image to be a properly orientated image, on which is recorded a program for causing a computer to perform a process, said process comprising:

determining whether a line orientation of the input document image is either vertical or horizontal;

detecting whether or not to require a rotation, a rotational angle if the rotation is required, and mirror image flipping, which are intended for correcting a character image extracted from the input document image to be properly orientated, in correspondence with a result of a determination; and

correcting the input document image to be a properly orientated document image based

on a result of detection.

17. (original) A document image correcting device correcting an input document image to be a properly orientated image, comprising:

line orientation determining means for determining whether a line orientation of an input document image is either vertical or horizontal;

character image extracting means for extracting a character image from the input document image;

character orientation detecting means for detecting whether or not to require a rotation, a rotational angle if the rotation is required, and mirror image flipping, which are intended for correcting the character image extracted by said character image extracting means to be properly orientated, in correspondence with a result of a determination made by said line orientation determining means; and

document image correcting means for correcting the input document image to be a properly orientated document image based on a result of detection made by said character orientation detecting means.

18. (new) A method, comprising

detecting an actual orientation of a document by determining a line orientation of a line of text in the document and determining a text reading orientation of text in the line responsive to the line orientation; and

orienting the document into a reading orientation responsive to the actual orientation.
